الجمهورية الجزائرية الديمقراطية الشعبية

People`s Democratic Republic of Algeria

Ministry of Higher Education and Scientific Research

National School of Cyber Security

Foundation Training Department

وزارة التعليم العالي والبحث العلمي

المدرسة الوطنية العليا في الأمن السيبراني

قسم التكوين القاعدي

LEVEL : 1st Year Basic Training

SECTION / GROUP : A & B

MODULE : . . Mathematical analysis1 .

FULL NAME :. . . . . .

. .

Midterm 1 Test

MODULE'S TEACHER:

Dr B.Chaouchi

DATE :..26 / 11/ 2024

DURATION : 1h30

NOTE :No documents are allowed.

Exercice 1. [6] ***pts***

Solve in $\mathbb{R}$ the following equation $|x^2-1|+|x+2|=|x-3|$.

Exercice 2. [5] ***pts***

Let $A \subset \mathbb{R}$ the set defined by $A=\left\{x_n=\dfrac{8}{n^2+2}, n\in\mathbb{N}\right\}$

1. Show that A is bounded set
2. Determine $\sup A$ and $\max A$
3. Determine $\inf A$ (with the complete proof)

Exercice 3. [3] ***pts***

Determine

1. $\lim\limits_{x\to 0}\dfrac{(1+x)^b-1}{x}, b\in\mathbb{R}$
2. $\lim\limits_{x\to+\infty} 3x^2\left(\cos\left(\dfrac{1}{x}\right)-\cos\left(\dfrac{3}{x}\right)\right)$
3. $\lim\limits_{x\to 0}\dfrac{1-\cos^b x}{x^2}, b\in\mathbb{R}$

Exercice 4. [3] ***pts***

Prove the following formula

$$\cos\left(\frac{x}{2}\right)\cdot\cos\left(\frac{x}{2^2}\right)\cdot\ldots\ldots\cdot\cos\left(\frac{x}{2^n}\right)=\frac{\sin x.}{2^n.\sin\left(\dfrac{x}{2^n}\right)}$$

Exercice 5. [3] ***pts***

Let $x,y\in\mathbb{R}$. Show that

$$x^2+y^2+1>x\sqrt{y^2+1}+y\sqrt{x^2+1}$$